

Listing of the Claims:

The following is a complete listing of all the claims in the application, with an indication of the status of each:

- 1 1 (Currently Amended). A protection switching method for a passive
2 optical network (PON) system including
3 an optical line terminal for switching between a first active-system
4 transmission/reception section and a first standby-system
5 transmission/reception section by using a switch,
6 a plurality of network units for selectively connecting second
7 active-system transmission/reception sections and second standby-system
8 transmission/reception sections to subscriber terminals upon switching
9 said sections through selectors in the event of a communication
10 abnormality, and
11 transmission paths for star-connecting said second active-system
12 transmission/reception sections to said first active-system
13 transmission/reception section, and also star-connecting said second
14 standby-system transmission/reception sections to said first standby-system
15 transmission/reception section, characterized by comprising the steps of:
16 setting an active-system virtual path and a standby-system virtual
17 path between said optical line terminal and said subscriber terminal in
18 different bands;
19 outputting by said switch a data cell to one of a plurality of ports, to
20 which said first active-system transmission/reception section and said first
21 standby-system transmission/reception section are connected, in
22 accordance with one of a header value added to the data cell or a time slot
23 of a frame;
24 detecting a communication abnormality in at least one active-
25 system virtual path established between said optical line terminal and said
26 subscriber terminal through said transmission path and said network unit;

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27 and
28 upon detection of a communication abnormality in the active-
29 system virtual path, causing switching by said switch to switch only the
30 transmission paths to establish a standby-system virtual path between said
31 optical line terminal and said subscriber terminal serving as a
32 communication partner, without affecting communication through normal
33 virtual paths in the PON system.

1 2 (Currently Amended). A method according to claim 1, wherein the
2 method further comprises
3 the step of simultaneously transmitting warning signals indicating
4 communication abnormalities from said network units, and
5 the step of establishing switching comprises the step of
6 simultaneously switching a plurality of active-system virtual paths between
7 said optical line terminal and said subscriber terminals to a plurality of
8 standby-system virtual paths by simultaneously switching/controlling all
9 ports of said switch in said optical line terminal upon reception of the
10 warning signals.

1 3 (Currently Amended). A method according to claim 1, wherein the
2 method further comprises
3 the step of simultaneously transmitting warning signals indicating
4 communication abnormalities from said network units which have
5 accessed signals distributed from said optical line terminal, and
6 the step of establishing switching comprises the step of
7 simultaneously switching a plurality of active-system virtual paths between
8 said optical line terminal and said subscriber terminals to a plurality of
9 standby-system virtual paths by simultaneously switching/controlling
10 predetermined ports of said switch in said optical line terminal upon
11 reception of the warning signals.

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1 4 (Original). A method according to claim 1, further comprising the steps
2 of:

3 transmitting a selector switching signal from said optical line
4 terminal to said network unit when a communication abnormality in the
5 active-system virtual path is detected; and

6 selectively switching said active-system transmission/reception
7 section and said standby-system transmission/reception section in said
8 network unit when the selector switching signal is received.

5 (Canceled).

1 6 (Currently Amended). A method according to claim 1, wherein
2 the ~~method further comprises~~ the step of setting, in different bands,
3 a plurality of first active-system virtual paths running through said first and
4 second active-system transmission/reception sections, establishes a
5 plurality of second active-system virtual paths running through said first
6 and second standby-system transmission/reception sections, first standby-
7 system virtual paths running through said first and second active-system
8 transmission/reception sections, and second standby-system virtual paths
9 running through said first and second standby-system
10 transmission/reception sections, and

11 the step of ~~establishing~~ switching comprises the step of switching
12 the virtual path to one of the first and second standby-system virtual paths
13 through said switch when a communication abnormality is detected in one
14 of the first and second active-system virtual paths.

1 7 (Original). A method according to claim 6, further comprising the step of
2 resetting the second active-system virtual path and the second standby-
3 system virtual path to share a band assigned to said first active-system

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4 transmission/reception section when communication abnormalities are
5 detected in all said first active-system virtual paths.

1 8 (Original). A method according to claim 6, further comprising the step of
2 resetting the first active-system virtual path and the first standby-system
3 virtual path to share a band assigned to said first active-system
4 transmission/reception section when communication abnormalities are
5 detected in all said second active-system virtual paths.

1 9 (Currently Amended). A method according to claim 1, wherein ~~the~~
2 ~~method further comprises the step of setting a plurality of active-system~~
3 ~~virtual paths in different bands, and the step of establishing switching~~
4 comprises the step of, when a communication abnormality occurs in one of
5 the active-system virtual paths, limiting a band set for the remaining
6 normal active-system virtual paths and using a surplus band as a standby-
7 system virtual path.

1 10 (Currently Amended). A method according to claim 1, wherein the
2 method further comprises
3 the step of setting a plurality of active-system virtual paths and a
4 plurality of standby-system virtual paths, and
5 the step of ~~establishing~~ switching further comprises the step of
6 switching active-system virtual paths, except for an active-system virtual
7 path assigned to a specific subscriber terminal for which no protection is
8 required, to standby-system virtual paths, except for a standby-system
9 virtual path assigned to said specific subscriber terminal, in the event of
10 communication abnormalities in the active-system virtual paths except for
11 the active-system virtual path assigned to said specific subscriber terminal.

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1 11 (Currently Amended). A method according to claim 1, wherein the
2 method further comprises the steps of:
3 setting a plurality of active-system virtual paths between said
4 subscriber terminal and a plurality of first transmission/reception means
5 corresponding to said active-system transmission/reception section; and
6 setting a standby-system virtual path between said subscriber
7 terminal and second transmission/reception means corresponding to said
8 standby-system transmission/reception section, and
9 the step of establishing switching comprises the step of, when an
10 abnormality is detected in an active-system virtual path, switching the
11 active-system virtual path in which the abnormality is detected to a
12 standby-system virtual path by using a band held by said second
13 transmission/reception means.

1 12 (Currently Amended). A protection switching apparatus for a passive
2 optical network (PON) system characterized by comprising:
3 an optical line terminal having a first active-system
4 transmission/reception section and a first standby-system
5 transmission/reception section for transmitting/receiving signals and
6 detecting communication abnormalities in transmission paths;
7 a plurality of network units each having a second active-system
8 transmission/reception section and a second standby-system
9 transmission/reception section respectively connected to said first active-
10 system transmission/reception section and said standby-system
11 transmission/reception section through the transmission paths, said
12 network units being star-connected to said optical line terminal through the
13 transmission paths and active-system virtual paths and standby-system
14 virtual paths between said optical line terminal and said subscriber
15 terminal are set in different bands;
16 selectors which are respectively arranged in said network units to

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17 select said second active-system transmission/reception section and said
18 second standby-system transmission/reception section connected to normal
19 transmission paths, one of said selected second active-system
20 transmission/reception section and said selected second standby-system
21 transmission/reception section being connected to subscriber terminals;

22 a switch which is arranged in said optical line terminal to establish
23 a virtual path between said optical line terminal and said network unit by
24 switching and connecting the transmission path between said first active-
25 system transmission/reception section and said first standby-system
26 transmission/reception, said switch outputs a data cell to one of a plurality
27 of ports, to which said first active-system transmission/reception section
28 and said first standby-system transmission/reception section are connected,
29 in accordance with one of a header value added to the data cell or a time
30 slot of a frame; and

31 a first control section which is arranged in said optical line terminal
32 to control said switch, upon detection of a communication abnormality in
33 the transmission path, so as to switch only the abnormal transmission path
34 to a normal transmission path without affecting communication through
35 normal virtual paths in the PON system, thereby reestablishing a virtual
36 path to said subscriber terminal in which the communication abnormality
37 has occurred, the virtual path being constituted by an active-system virtual
38 path and a standby-system virtual path.

1 13 (Original). An apparatus according to claim 12, wherein the
2 transmission path is formed from a metal line.

1 14 (Original). An apparatus according to claim 12, wherein the
2 transmission path is formed from a coaxial cable.

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1 15 (Original). An apparatus according to claim 12, wherein the
2 transmission path is an optical transmission path, and said network unit is
3 an optical network unit.

1 16 (Original). An apparatus according to claim 15, wherein the optical
2 transmission paths respectively star-connect said second active-system
3 transmission/reception section and said second standby-system
4 transmission/reception section to said first active-system
5 transmission/reception section and said first standby-system
6 transmission/reception section through photocouplers.

1 17 (Previously presented). An apparatus according to claim 12, wherein
2 said switch outputs an ATM (Asynchronous Transmission Mode) cell to
3 one of a plurality of ports, to which said first active-system
4 transmission/reception section and said first standby-system
5 transmission/reception section are connected, in accordance with a header
6 value added to the ATM cell.

1 18 (Original). An apparatus according to claim 12, wherein said switch
2 determines an output port for data in a synchronous transfer mode in
3 accordance with a time slot of a frame.

1 19 (Original). An apparatus according to claim 12, wherein said network
2 units transmit warning signals indicating communication abnormalities in
3 the transmission paths, and said first control section switches/controls all
4 ports of said switch to simultaneously switch virtual paths between said
5 optical line terminal and said subscriber terminals from active-system
6 virtual paths to standby-system virtual paths upon simultaneously
7 receiving the warning signals from said network units.

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1 20 (Original). An apparatus according to claim 12, wherein said network
2 units which have accessed signals distributed from said optical line
3 terminal transmit warning signals indicating communication abnormalities
4 in the transmission paths, and said first control section switches/controls
5 predetermined ports of said switch to simultaneously switch virtual paths
6 between said optical line terminal and said subscriber terminals from
7 active-system virtual paths to standby-system virtual paths upon
8 simultaneously receiving the warning signals from said network units.

1 21 (Original). An apparatus according to claim 12, wherein said first
2 control section transmits a selector switching signal to said network unit
3 when a communication abnormality is detected in the transmission path,
4 and said network unit comprises a second control section for controlling
5 said selector to selectively switch said second active-system
6 transmission/reception section and said second standby-system
7 transmission/reception section upon reception of the selector switching
8 signal from said optical line terminal.

22 (Canceled).

1 23 (Original). An apparatus according to claim 12, wherein the virtual path
2 comprises a plurality of first active-system virtual paths running through
3 said first and second transmission/reception sections, a plurality of second
4 active-system virtual paths running through said first and second standby-
5 system transmission/reception sections, a first standby-system virtual path
6 running through said first and second active-system transmission/reception
7 sections, and a second standby-system virtual path running through said
8 first and second standby-system transmission/reception sections, the first
9 and second active-system virtual paths and the first and second standby-
10 system virtual paths being set in different bands, and said first control

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11 section controls said switch to switch the virtual path to one of the first and
12 second standby-system virtual paths when a communication abnormality is
13 detected in one of the first and second active-system virtual paths.

1 24 (Original). An apparatus according to claim 23, wherein when
2 communication abnormalities are detected in all the first active-system
3 virtual paths, a second active-system virtual path and a second standby-
4 system virtual path are reset to share a band assigned to said first standby-
5 system transmission/reception section.

1 25 (Original). An apparatus according to claim 23, wherein when
2 communication abnormalities are detected in all the second active-system
3 virtual paths, a first active-system virtual path and a first standby-system
4 virtual path are reset to share a band assigned to said first active-system
5 transmission/reception section.

1 26 (Currently amended). An apparatus according to claim 12, wherein a
2 ~~plurality of active-system virtual paths are set in different bands, and~~ when
3 a communication abnormality is detected in an active-system virtual path,
4 a band set for remaining normal active-system virtual paths is limited, and
5 a surplus band is used as a standby-system virtual path.

1 27 (Original). An apparatus according to claim 12, wherein a plurality of
2 active-system virtual paths and a plurality of standby-system virtual paths
3 are set, and said first control section controls said switch, in the event of
4 communication abnormalities in active-system virtual paths except for an
5 active-system virtual path assigned to a specific subscriber terminal for
6 which no protection is required, so as to switch. the active-system virtual-
7 paths in which the communication abnormalities have occurred to standby-
8 system virtual paths except for a standby-system virtual path assigned to

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9 said specific subscriber terminal.

1 28 (Previously Presented). An apparatus according to claim 12, wherein a
2 plurality of active-system virtual paths are set between said subscriber
3 terminals and a plurality of first transmission/reception means
4 corresponding to said active-system transmission/reception sections, a
5 standby-system virtual path forming a virtual path is set between said
6 subscriber terminal and second transmission/reception means
7 corresponding to said standby-system transmission/reception section, and
8 when an abnormality is detected in an active-system virtual path, the
9 active-system virtual path in which the abnormality has been detected is
10 switched to a standby-system virtual path by using a band held by said
11 second transmission/reception means.

1 29 (New). A method according to claim 1, wherein said step of
2 transmitting transmits an ATM (Asynchronous Transmission Mode) cell to
3 one of a plurality of ports, to which said first active-system
4 transmission/reception section and said first standby-system
5 transmission/reception section are connected, in accordance with a header
6 added to the ATM cell.

1 30 (New). A method according to claim 1, wherein said step of
2 transmitting transmits a data cell to one of a plurality of ports, wo which
3 said first active-system transmission/reception section and said first
4 standby-system transmission/reception section are connected, in a
5 synchronous transfer mode in accordance with a time slot of a frame.

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